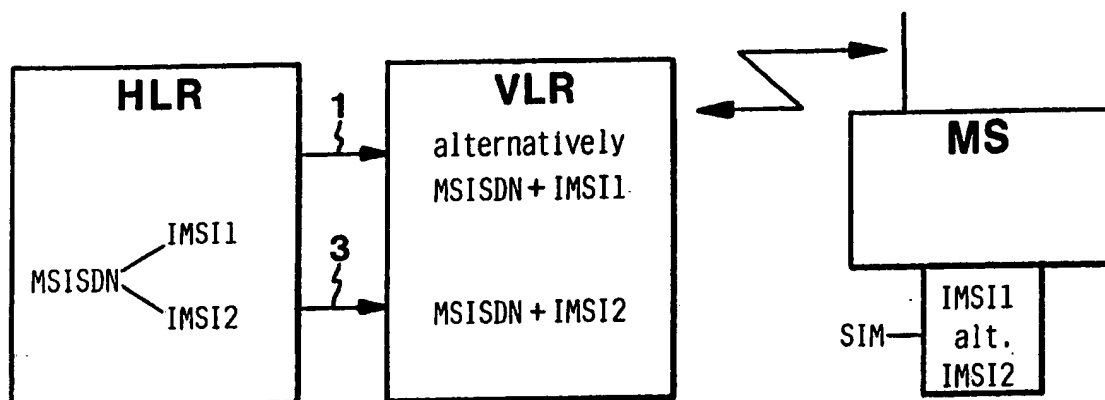




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁵ : H04Q 7/04, H04B 7/26	A1	(11) International Publication Number: WO 92/19078 (43) International Publication Date: 29 October 1992 (29.10.92)
(21) International Application Number: PCT/SE92/00227 (22) International Filing Date: 8 April 1992 (08.04.92) (30) Priority data: 9101105-6 12 April 1991 (12.04.91) SE (71) Applicant (for all designated States except US): COMVIK GSM AB [SE/SE]; P.O. Box 123, S-126 23 Hägersten (SE). (72) Inventor; and (75) Inventor/Applicant (for US only) : JULIN, Tomas [SE/SE]; Andvägen 32, S-184 61 Åkersberga (SE). (74) Agent: AWAPATENT AB; Box 45086, S-104 30 Stock- holm (SE).		(81) Designated States: AT (European patent), AU, BE (Euro- pean patent), CA, CH (European patent), DE (Euro- pean patent), DK (European patent), ES (European pa- tent), FI, FR (European patent), GB (European patent), GR (European patent), IT (European patent), JP, LU (European patent), MC (European patent), NL (Euro- pean patent), NO, SE (European patent), US. Published <i>With international search report.</i>

(54) Title: METHOD IN MOBILE TELEPHONE SYSTEMS IN WHICH A SUBSCRIBER IDENTITY MODULE (SIM) IS ALLOCATED AT LEAST TWO IDENTITIES WHICH ARE SELECTIVELY ACTIVATED BY THE USER

**(57) Abstract**

Method in mobile telephone systems, especially of the GSM type, in which a subscriber identity module (SIM) is allocated at least two identities (IMSI 1, IMSI 2) which are selectively activated by the user. A preferred embodiment of a subscriber identity module consists of an active card which can be inserted in two different positions corresponding to one and the other identity, respectively. Preferably, the positions pertain, respectively, to one and the other end of the card.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	FI	Finland	ML	Mali
AU	Australia	FR	France	MN	Mongolia
BB	Barbados	GA	Gabon	MR	Mauritania
BE	Belgium	GB	United Kingdom	MW	Malawi
BF	Burkina Faso	GN	Guinea	NL	Netherlands
BG	Bulgaria	GR	Greece	NO	Norway
BJ	Benin	HU	Hungary	PL	Poland
BR	Brazil	IE	Ireland	RO	Romania
CA	Canada	IT	Italy	RU	Russian Federation
CF	Central African Republic	JP	Japan	SD	Sudan
CG	Congo	KP	Democratic People's Republic of Korea	SE	Sweden
CH	Switzerland	KR	Republic of Korea	SN	Senegal
CI	Côte d'Ivoire	LI	Liechtenstein	SU	Soviet Union
CM	Cameroon	LK	Sri Lanka	TD	Chad
CS	Czechoslovakia	LU	Luxembourg	TG	Togo
DE	Germany	MC	Monaco	US	United States of America
DK	Denmark	MG	Madagascar		
ES	Spain				

METHOD IN MOBILE TELEPHONE SYSTEMS IN WHICH A SUBSCRIBER
IDENTITY MODULE (SIM) IS ALLOCATED AT LEAST TWO IDENTITIES
WHICH ARE SELECTIVELY ACTIVATED BY THE USER

Field of the Invention

The present invention relates to telephone systems,
5 preferably mobile telephone systems, in which the sub-
scriber units, preferably mobile units or stations, are
controlled by a subscriber identity module. More speci-
fically, the invention concerns a method in such a tele-
phone system, wherein the subscriber identity module is
10 utilised in a new way, as well as a subscriber identity
module especially suited for use in connection with the
method.

The invention is advantageously applied to a tele-
phone system of the GSM type (Global System for Mobile
15 Communication). Although the invention is by no means
restricted to such an application, it will be described
hereinafter with reference to a system of this type.

Background of the Invention

GSM is a uniform, intelligent digital mobile tele-
20 phone system which is not geographically confined to a
single country. A subscriber may use any subscriber unit
(Mobile Station - MS) by controlling it with the aid of a
subscriber identity module (SIM), which may be an active
card or a plug-in unit inserted in the subscriber unit and
25 producing the subscriber's identity (IMSI) which is allo-
cated to a directory number (Mobile Station International
ISDN number - MSISDN). Information on IMSI and MSISDN is
stored, together with other information relating to the
subscriber, in a home database (Home Location Register -
30 HLR) with the operator of the network including the sub-
scriber. The system comprises visitor databases (Visitor
Location Register - VLR) and switches (Mobile Services
Switching Centre - MSC). Information on an activated sub-
scriber unit MS is temporarily stored in the VLR pertain-
35 ing to the area of location of the subscriber unit MS.

Since the above concepts, as well as the design and operation of the system as a whole, are subjected to extensive standardisation, no detailed description seems required here.

5 Systems of the above type are widely used for service calls, but also to some extent for private calls. Distributing the costs for service and private calls usually cause problems or involves extra work.

One and the same subscription can also be used by
10 different people, e.g. within one and the same company. Also in this case, distributing the costs among the different people concerned may cause problems or involve extra work.

Object of the Invention

15 The object of the present invention is to eliminate the above inconveniences and also in other respects enable a more flexible use of subscriptions and subscriber identity modules.

Summary of the Invention

20 This object is achieved by a method and a subscriber identity module having the distinctive features recited in the appended claims.

The invention is thus based on the insight that a subscriber identity module can be allocated at least two
25 different identities which are selectively activable by the user. As will be appreciated, there may be two identities, e.g. a service identity and a private identity, which belong to the same user, which seems to be the currently preferred case. However, different identities might
30 also be used, which correspond to several potential users of the subscriber identity module.

Preferably, only one identity can be activated at a time, i.e. a change of identity means that the previously activated identity must first be deactivated before the
35 new identity can be regarded as activated. The associated home database is suitably made to store information on

which identity is activated, so that calls can be set up, cost information stored and so forth in a correct way.

The subscriber identity module can be so designed that the selective identity activation, i.e. the selection
5 of identity function in the subscriber identity module, can be carried out with the aid of keys or the like provided on the subscriber unit, or with the aid of special means provided on the subscriber identity module, e.g. so-called touch contacts when the module is an active card.
10 The activation may then, for instance, take place in connection with the input of a so-called PIN code. In that case, each identity can be allocated a special code. This means that a number of different users (corresponding to the number of different identities) can share the sub-
15 scriber identity module employed. It is also possible to have a user's PIN code supplemented with code elements for selecting the desired identity (for instance, service or private).

In a preferred embodiment of the subscriber identity
20 module according to the invention, the module is an active card designed to be inserted in the subscriber unit in two different positions, preferably with one or the other end first, each position corresponding to an allocated identity. This enables an embodiment in which each identity
25 function is clearly marked on the card, which thus becomes easy to handle. A change of identity is performed simply by taking out the card and then again inserting it, now in the other position, e.g. when switching from a service call to a private call, or vice versa.

30 It will be appreciated that the subscriber identity module according to the invention may be provided with specially programmed circuits which contain either integrated identity functions or separate, 'parallell' identity functions. With an active card having two different
35 positions, the latter design is readily achieved by the provision of a first circuit at one end of the card and a second circuit at the other end of the card, all in com-

pliance with current standards for such cards in respect of the positioning of the contact means, and so forth. Thus, one side of the card is able to identify one identity, while the other side identifies the other identity.

5 As to the allocation of directory numbers in a home database, there are different alternatives in accordance with the invention.

10 In a first alternative, the different identities of the subscriber identity module are allocated to one and same directory number. The home database is designed to set up calls against and register cost information etc. for the current combination of directory number and identity. For properly performing this, the home database should be informed of which identity is activated. This
15 can be done in that only one identity can be activated at a time, so that when a 'new' identity is activated, the preceding identity is always deactivated and the home database informed thereof. Such deactivation may, for instance, be performed by using a function of the type
20 'Cancel IMSI', which is employed in GSM-type systems. Such deactivation means that information on this identity is cancelled from the visitor database employed, and that the home database is always informed when the identity is again activated.

25 An incoming call is set up against the activated identity, controlled by the information in the home database.

30 If there is no information on the activated identity, an incoming call can first be set up against a selected identity among the possible identities. If the selected identity is found to be non-activated, the call can be transferred so as to be set up against the next possible identity etc., in accordance with the information in the home database.

35 It should be observed that a network operator can modify the function of his home database without coming

into conflict with the standard of e.g. a system of GSM type.

In a second alternative, the different identities of the subscriber identity module are each allocated to a unique directory number. Of these directory numbers, one particular number is the subscriber's external telephone number, while the other number(s) is (are) only used in the home database and may be unknown to the subscriber and to the public. It is convenient also in this case that only one identity can be activated at a time and that the home database is informed thereof, e.g. as in the first alternative.

When there is an outgoing call, the selected and activated identity is used together with the allocated directory number in conventional manner.

Incoming calls are always set up against the identity allocated to the special directory number, provided that this identity is activated. If not, the call can be transferred to the subscriber's next directory number with associated identity. It will be appreciated that this transfer can be performed directly, without the call being set up against the first-mentioned identity, if the home database knows which identity is activated.

For call transfer, use may, according to the invention, advantageously be made of a function of the type 'Call Forwarding Unconditional' (CFU), which is a well-known standard function adapted to be controlled by the subscriber. By adding a corresponding function, controlled by the network operator, to the home database, one or more of the subscriber's directory numbers can be supplemented for direct transfer in the event of the associated identity being non-activated and provided that the subscriber has not himself made any arrangements for other direct call transfer.

In a third alternative, which is a further development of the second alternative, two of the subscriber's directory numbers are external telephone numbers, of which

one suitably is a service number and the other is a private number. Informing of the activated identity and the direct call transfer can be performed as in the second alternative.

5 Thus, it will be appreciated that the present invention provides several different options for a subscriber as to different identities and amounts of external telephone numbers, while using a single subscriber identity module.

10 The invention will be illustrated in more detail below with the aid of non-restricting embodiments, reference being made to the accompanying drawings.

Brief Description of the Drawings

15 Fig. 1 is a highly schematic diagram illustrating an embodiment of the invention,

Fig. 2, which is a diagram similar to that of Fig. 1, illustrates another embodiment of the invention.

20 Fig. 3 is a highly schematic diagram illustrating the information flow occurring when an identity is activated and deactivated in accordance with an embodiment of the invention,

Fig. 4 illustrates a supplementary addition to a home data base in accordance with an embodiment of the invention,

25 Fig. 5 is a flow chart illustrating a mode of using a 'Call Forwarding Unconditional' function in accordance with the invention, and

Fig. 6 is a schematic top plan view of an active card modified for use as a subscriber identity module in accordance with an embodiment of the invention.

Description of the Preferred Embodiments

35 Fig. 1 schematically illustrates how an embodiment of the invention can be implemented in a mobile telephone system of the GSM type. The home database HLR and the visitor database VLR communicate with one another, as indicated by the arrows 1 and 3. The visitor database VLR is in wireless communication with the mobile station MS,

which is controlled by a SIM card which is activable to give the identity IMSI 1 or the identity IMSI 2. The directory number MSISDN corresponds to these identities. Information on MSISDN and the linkage to the two identities IMSI 1 and IMSI 2 are stored in the home database HLR.

When IMSI 1 or IMSI 2 is activated by means of the SIM card in the mobile station MS, information thereon is signalled to the home database HLR, which transmits information on the current combination MSISDN-IMSI 1, or MSISDN-IMSI 2, to VLR in customary manner. Then, the call is set up in the usual way in consideration of the selected combination.

Fig. 2 schematically illustrates another embodiment of the invention, in which each identity IMSI 1 and IMSI 2 is allocated to a directory number MSISDN 1 and MSISDN 2, respectively, which both are external telephone numbers. For the activated combination MSISDN-IMSI, the call is set up etc. in customary manner.

Fig. 3 illustrates the essential steps in the information flow that may be used for ensuring that the home database HLR is informed of which of the identities IMSI 1 and IMSI 2 is activated.

In the initial position (at the top), IMSI 1 is assumed to have been activated by the insertion of the SIM card with one end first into the mobile station. Now, the user pulls out the card and inserts it again with the other end first in order to activate IMSI 2. Then, IMSI 2 is signalled to the visitor database VLR which, noting that the IMSI is a non-registered one, transmits updating signals to the home database HLR, which stores information on IMSI 2 being activated, and deactivates IMSI 1 by emitting a signal 'Cancel ISMI 1'. Thus, the temporary activation of IMSI 1 is cancelled from the current visitor database VLR that belongs to the area of location of the mobile station MS. Thereafter, data on IMSI 2 is transmitted to the visitor database. The call can now be set up

by using the combination MSISDN 2-IMSI 2. When the user once again turns the SIM card, i.e. changes identities, a corresponding activation of IMSI 1 and a corresponding deactivation of IMSI 2 take place.

5 When there is an incoming call to the directory number whose identity is not activated, the call is transferred directly to the other directory number by using 'Call Forwarding Unconditional'. To this end, the home database is extended with one field for each directory
10 number, as illustrated in Fig. 4. The added field is the one at the very bottom. For MSISDN 1 is here entered: call transfer to MSISDN 2, and vice versa. The call transfer in accordance with these added fields takes place on condition that the user has not himself initiated any transfer
15 of this kind, which in that case would appear from the field immediately above.

The entry of the additional fields of the home database is conveniently carried out simultaneously with the signalling sequence according to Fig. 3. The entry is
20 exemplified in the flow chart of Fig. 5.

Thus, the 'Call Forwarding Unconditional' can be implemented only if the subscriber has not himself requested such call transfer to another number. In other words, the subscriber may still use this subscriber service as usual. If he does not, the home database HLR will
25 transfer an incoming call from the non-activated combination MSISDN-IMSI to the combination as last activated and registered.

Thus, it will be appreciated that the subscriber has
30 several different options: one or two external telephone numbers; automatic transfer of service calls to the private number, and vice versa; or other personally-controlled call transfer.

Fig. 6 schematically illustrates an activated card
35 that has been modified in accordance with the invention so as to provide two identity functions. At one end, the card is equipped in conventional manner with a circuit so as

9

to provide a first identity function when inserted into a mobile station, as indicated by the arrow 15. The illustrated side of the card may be a service side and have a suitable and clear marking to this effect.

5 The other side of the card is the private side. For this purpose, a second, completely separate circuit 17 is provided at the other end of the card and on the private side, in accordance with current standards for the arrangement of circuits and contacts. When the private
10 side is to be used, the card is inserted with said other end first, as indicated by the arrow 19 on the private side. This side may also have a suitable and clear identity marking.

15

20

25

30

35

CLAIMS

1. Method in telephone systems, preferably mobile
5 telephone systems, especially of the GSM type, in which
subscriber units (MS) are controlled by a subscriber
identity module (SIM), c h a r a c t e r i s e d in
that the subscriber identity module (SIM) is allocated at
least two identities (IMSI 1, IMSI 2) which are selec-
10 tively usable, the user selectively activating the desired
identity when using a subscriber unit (MS).

2. The method of claim 1, in which the subscriber
identity module (SIM) is of the active-card type,
c h a r a c t e r i s e d in that use is made of a sub-
15 scriber identity module (SIM) which has double identity
functions and is so designed that one identity (IMSI 1) is
utilised when the module (SIM) is inserted in the subscri-
ber unit (MS) in a first position, especially with one end
first, and that the other identity (IMSI 2) is utilised
20 when the module (SIM) is inserted in the subscriber unit
(MS) in a second position, especially with the other end
first.

3. The method of claim 1, c h a r a c t e r i s -
e d in that use is made of a subscriber identity module
25 (SIM) which has at least two identity functions, the
desired identity being selectively activated with the aid
of the keys of the subscriber unit (MS) or with the aid of
activating means provided on the subscriber identity
module.

30 4. The method of claim 3, c h a r a c t e r i s -
e d in that the desired identity is activated in connec-
tion with the input of a PIN code.

5. The method of any one of the preceding claims,
c h a r a c t e r i s e d in that the identities (IMSI 1,
35 IMSI 2) of the subscriber identity module (SIM) are allo-
cated to one and the same directory number (MSISDN), an
incoming call being set up against one or the other iden-

tity (IMSI 1 or IMSI 2), controlled by the subscriber's home database (HLR) in response to the selective identity activation.

6. The method of claim 5, c h a r a c t e r i s -
5 e d in that an incoming call is first set up against one identity (IMSI 1) and, if this identity is found to be non-activated, then against the other identity (IMSI 2) by call transfer.

7. The method of any one of claims 1-4, c h a r -
10 a c t e r i s e d in that the identities (IMSI 1, IMSI 2) of the subscriber identity module (SIM) are each allocated to a directory number (MSISDN 1 and MSISDN 2, respectively).

8. The method of claim 7, c h a r a c t e r i s -
15 e d in that one directory number (MSISDN 1) is the subscriber's external telephone number, an incoming call being transferred to the other directory number (MSISDN 2) when the identity (IMSI 1) allocated to the telephone number is not activated.

20 9. The method of claim 7, c h a r a c t e r i s -
e d in that the directory numbers (MSISDN 1, MSISDN 2) are external telephone numbers of the subscriber, e.g. a service telephone number and a private telephone number, an incoming call to a directory number (MSISDN 1 or MSISDN
25 2) whose allocated identity (IMSI 1 and IMSI 2, respectively) is not activated, being transferred to the other directory number (MSISDN 2 or MSISDN 1).

10. The method of claim 6, 8 or 9, c h a r a c -
t e r i s e d in that the call transfer relies on a func-
30 tion of the type 'Call Forwarding Unconditional', provided that this function has not been used by the subscriber.

11. The method of any one of the preceding claims, c h a r a c t e r i s e d in that only one identity (IMSI 1 or IMSI 2) can be activated at a time.

35 12. The method of claim 11, c h a r a c t e r i s -
e d in that, when one identity (IMSI 1 or IMSI 2) is selectively activated, involving a change of identity, the

12

previous identity is deactivated, controlled by the subscriber's home database (HLR).

13. Subscriber identity module (SIM) for use in connection with a subscriber unit in a telephone system, preferably a mobile telephone system, especially of the GSM type, characterised in that it includes at least two identity functions which are selectively activatable.

14. The subscriber identity module of claim 13, characterised in that it is of the active-card type and is designed for insertion into the subscriber unit in two different positions, preferably relating, respectively, to one and the other end of the card, one position allowing activation of a first identity (IMSI 1) and the other position allowing activation of a second identity (IMSI 2).

15. The subscriber identity module of claim 14, characterised in that it is provided with two separate circuitries, of which one is allocated one identity (IMSI 1) and the other is allocated the other identity (IMSI 2).

25

30

35

1/3

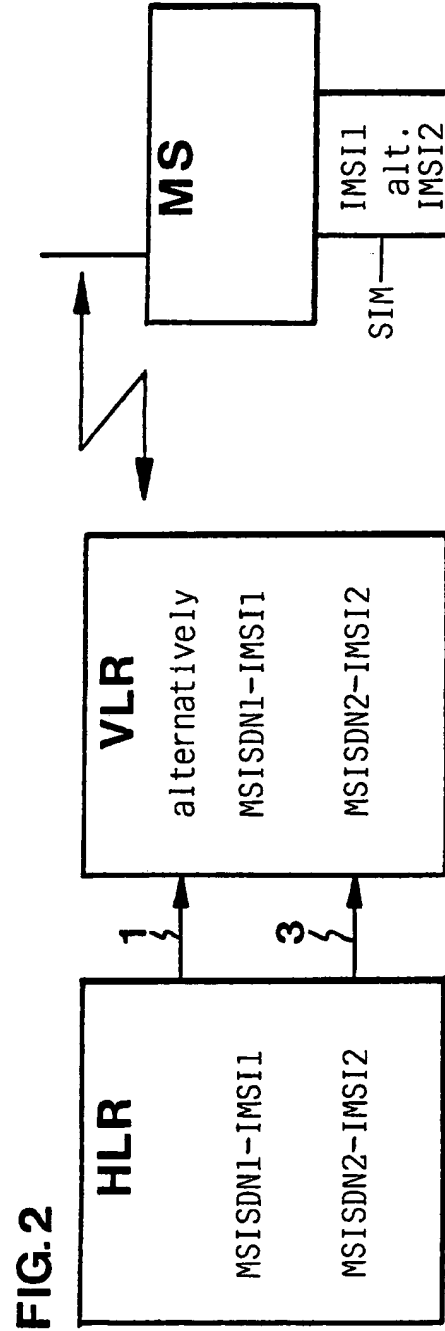
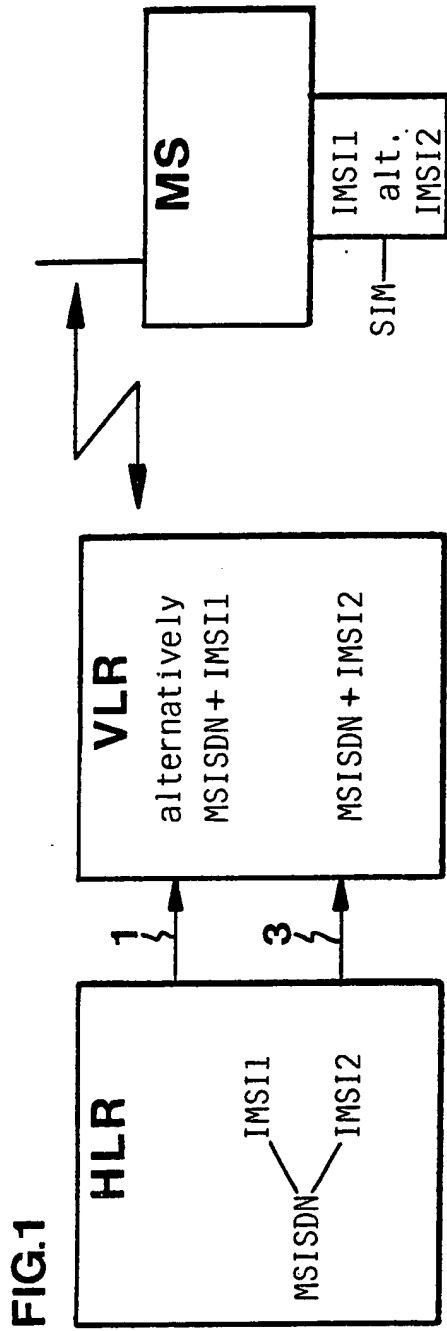


FIG.3

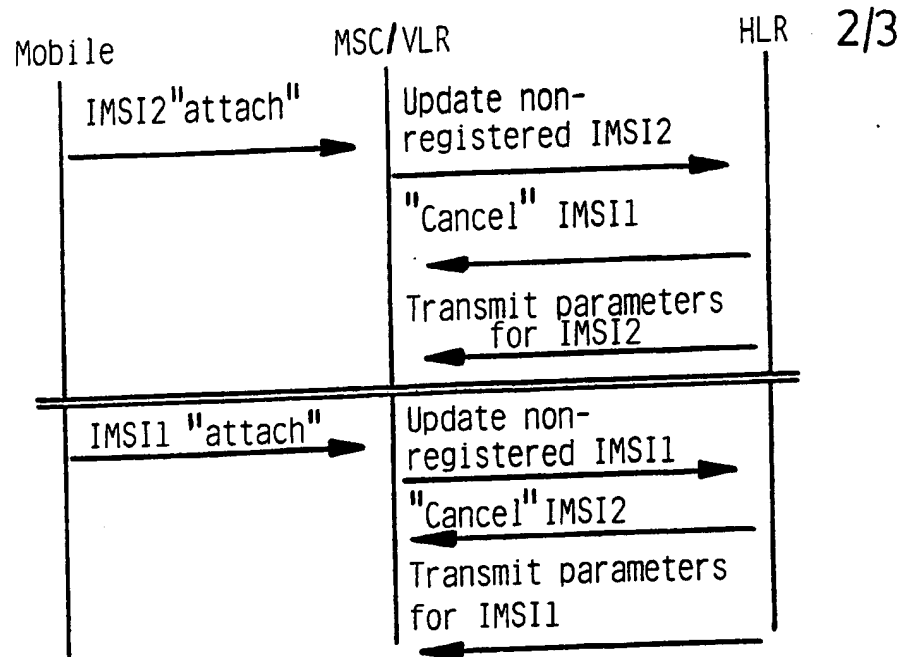
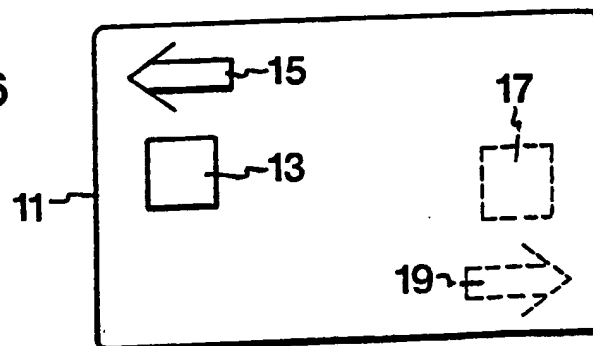


FIG.4

IMSI1
MSISDN1
Call Forwarding Unconditional Parameter, controlled by the subscriber
Call Forwarding Unconditional to MSISDN2 data, set by the network operator of MSISDN1

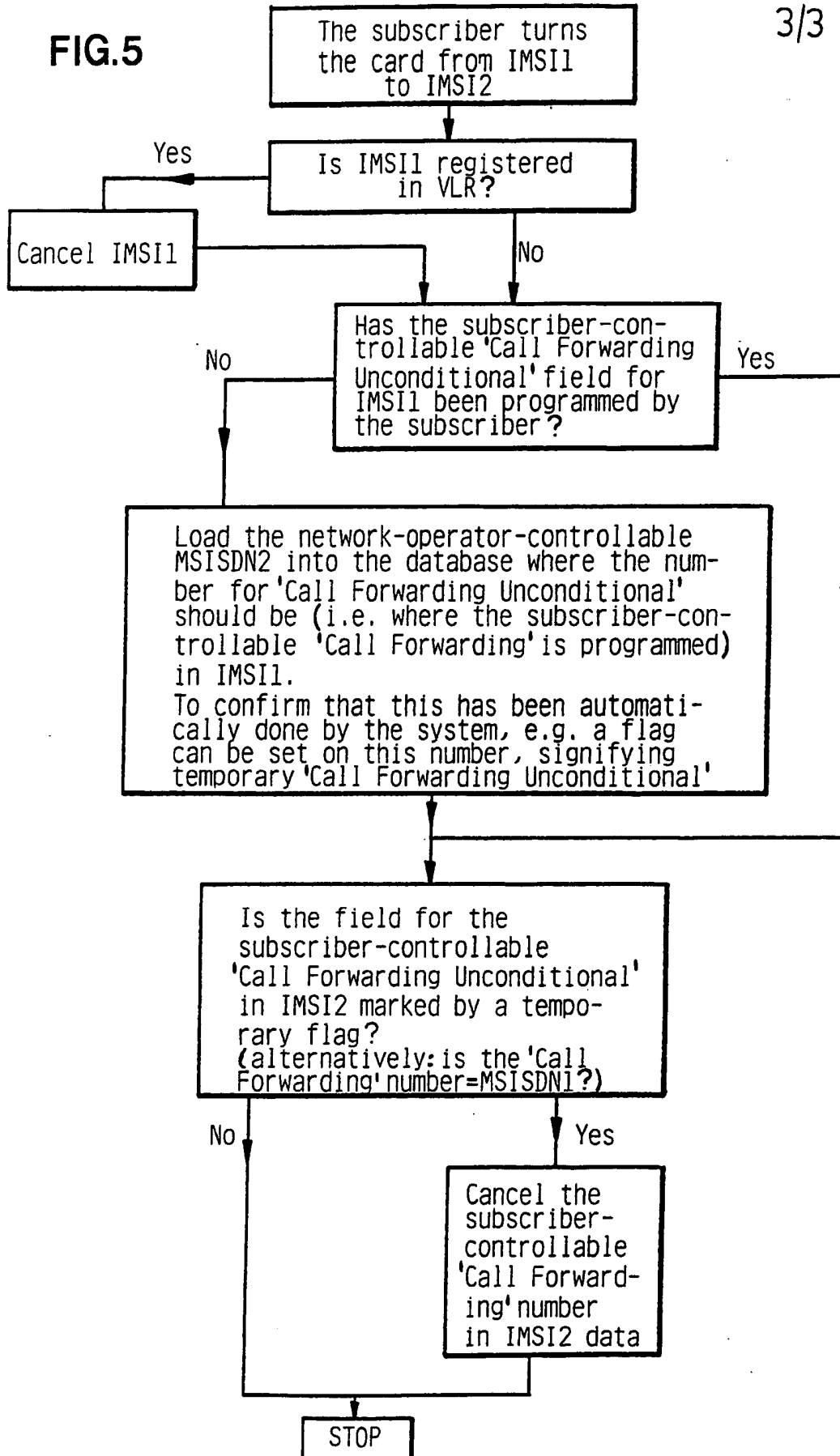
IMSI2
MSISDN2
Call Forwarding Unconditional Parameter, controlled by the subscriber
Call Forwarding Unconditional to MSISDN1 data, set by the network operator of MSISDN2

FIG.6



3/3

FIG.5



INTERNATIONAL SEARCH REPORT

International Application No **PCT/SE 92/00227**

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ⁶ According to International Patent Classification (IPC) or to both National Classification and IPC IPC5: H 04 Q 7/04, H 04 B 7/26						
II. FIELDS SEARCHED <div style="text-align: right; font-size: small;">Minimum Documentation Searched⁷</div> <table style="width: 100%; border: none;"> <tr> <td style="width: 25%; border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">Classification System</div> </td> <td style="border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">Classification Symbols</div> </td> </tr> <tr> <td style="border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">IPC5</div> </td> <td style="border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">H 04 B, H 04 Q, H 04 M</div> </td> </tr> </table>			<div style="border: 1px solid black; padding: 2px;">Classification System</div>	<div style="border: 1px solid black; padding: 2px;">Classification Symbols</div>	<div style="border: 1px solid black; padding: 2px;">IPC5</div>	<div style="border: 1px solid black; padding: 2px;">H 04 B, H 04 Q, H 04 M</div>
<div style="border: 1px solid black; padding: 2px;">Classification System</div>	<div style="border: 1px solid black; padding: 2px;">Classification Symbols</div>					
<div style="border: 1px solid black; padding: 2px;">IPC5</div>	<div style="border: 1px solid black; padding: 2px;">H 04 B, H 04 Q, H 04 M</div>					
<div style="text-align: center; font-size: small;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched⁸</div>						
SE,DK,FI,NO classes as above						
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹						
Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³				
A	DE, B2, 2147638 (TOYOTA MOTOR SALES CO.,LTD.) 23 January 1975, see column 1, line 54 - column 2, line 31 --	1-15				
A	US, A, 3581019 (DONALD P. RYAN ET AL) 25 May 1971, see the whole document --	1-15				
A	US, A, 4734928 (SHELDON WEINER ET AL) 29 March 1988, see column 3, line 17 - line 32 --	1-15				
A	US, A, 4868846 (YRJÖ KEMPPI) 19 September 1989, see the whole document --	1-15				
<div style="font-size: x-small;"> * Special categories of cited documents:¹⁰ "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family </div>						
IV. CERTIFICATION						
Date of the Actual Completion of the International Search		Date of Mailing of this International Search Report				
20th July 1992		1992 -07- 2 9				
International Searching Authority		Signature of Authorized Officer				
SWEDISH PATENT OFFICE		<i>Lars Henriksson</i> Lars Henriksson				

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	EP, A2, 378450 (TECHNOPHONE LIMITED) 18 July 1990, see column 3, line 53 - column 4, line 12 --	1-15
A	US, A, 4399330 (ROLAND KUENZEL) 16 August 1983, see the whole document -- -----	1-15

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.PCT/SE 92/00227**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the Swedish Patent Office EDP file on 01/07/92
The Swedish Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-B2- 2147638	75-01-23	FR-A- 2109822 GB-A- 1366372	72-05-26 74-09-11
US-A- 3581019	71-05-25	NONE	
US-A- 4734928	88-03-29	US-A- 4677653	87-06-30
US-A- 4868846	89-09-19	EP-A- 0301740 JP-A- 1106533	89-02-01 89-04-24
EP-A2- 378450	90-07-18	NONE	
US-A- 4399330	83-08-16	AT-E-T- 10795 AU-B- 552184 AU-D- 7508381 DE-A- 3034066 EP-A-B- 0047524 JP-A- 57080841	84-12-15 86-05-22 82-03-18 82-04-15 82-03-17 82-05-20

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☒ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☒ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.